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NORTHERN EUROPE: EXPLORING THE EXISTENCE OF A CROSS-NATIONALLY SINGLE BUSINESS MODEL

ABSTRACT

Considering that Iceland, Ireland, Denmark, the Netherlands, Norway, and Finland consistently highly perform across a range of global benchmarks that reflect inclusive governance, sustainability, innovation, and economic competitiveness, it is crucial to examine whether their economic and business activities exhibit unique and common characteristics that influence their ability to address global challenges, support public policy priorities, foster innovation, and maintain resilience in the face of economic or geopolitical disruptions. To achieve this goal, the authors developed a generalized business model for the selected Northern European countries. The model focuses on key factors such as meeting human needs, alignment with public policy goals, managing risk, promoting scientific and technological development, using natural resources efficiently, and considering geographical context. These elements are reflected in each country's optimal stock market portfolio. The study also tested the countries' resilience to global crises and the potential impact of military conflicts. Although the results did not support the existence of a cross-nationally single business model, Norway's business model was found to be unique compared to the other countries in the analysis. Finland and the Netherlands also demonstrated a high degree of alignment with the model, indicating that their current trajectories are closely in line with its parameters. This suggests a strong potential for policy and performance convergence in the near future. The authors utilized relevant Python packages and proposed a new approach to evaluating the intellectual contribution to the economy - the Intellectual Contribution Index. This index is constructed using data from the Crossref database, where each investment portfolio is assigned, a weighted score based on the frequency with which its associated industries appear in the titles of academic articles.

Keywords: business model, optimal portfolio, intellectual contribution index, science contribution index, Sharpe Ratio, Python packages, the Northern European countries

JEL Classification: D22, D83, F31, G11, L1

INTRODUCTION

According to Joseph Schumpeter (1934, 1950), an entrepreneur aims to disrupt the market. However, such a desire can arise in him if there are basic prerequisites for the implementation of innovation. We consider these prerequisites to be the continuous development of the individual (education, science, social adaptation), a sufficient level of security (adequate response to domestic conflicts, safe localization and extraction of natural resources, etc.), guarantees of the future (again, the development of science, the primacy of social priorities, the development of health care, etc.), effective use of own available resources and involvement of external ones (primarily through the stock market). Based on these prerequisites, we develop a generalized business model that captures the common features of countries, focusing on how they meet basic human needs such as healthcare, education, and social welfare, while aligning with broader public policy goals. The model also considers the region's risk profile, including economic instability and vulnerability to global crises, as well as its capacity for innovation and technological progress. In addition, it reflects the region's approach to using natural resources sustainably, aiming to balance economic growth with environmental protection. Geographical factors –such as location and access to global markets – also play a

role in shaping the model. Together, these elements are expressed in the region's optimal stock market portfolio, which represents its overall economic strategy and priorities.

The selection of the Northern European countries – Iceland, Ireland, Denmark, the Netherlands, Norway, and Finland – as the subject of this research is grounded in their consistently high performance across a range of global benchmarks that reflect inclusive governance, sustainability, innovation, and economic competitiveness. These nations stand out not only for their progressive social policies and low levels of corruption, as highlighted by the World Economic Forum (2018)[1] and Transparency International (2024), but also for their strong commitments to sustainable development, as demonstrated in the Sustainable Development Report (2024). Their populations report some of the highest levels of happiness globally (World Population Review, 2024), indicating broad societal well-being and trust in public institutions. Denmark, in particular, exemplifies an ideal environment for business, leading the IMD World Competitiveness Ranking in 2023. Moreover, Denmark, Finland, and the Netherlands consistently rank among the world's most innovative economies (World Intellectual Property Organization, 2024), reflecting a deep investment in research and education. While acknowledging that these countries vary in size and economic structure, their shared achievements in governance, innovation, and sustainability form a coherent basis for analysis.

LITERATURE REVIEW

The term "business model" was first mentioned in the Oxford Dictionary in 1832 as "a plan for the operation of an enterprise" (Oxford English Dictionary, n.d.), while it was first used in the scientific literature only in 1957 (Bellman et al., 1957).

Later, the concept of the "business model" has been interpreted in various ways within economic literature, often depending on its intended application. Amit and Zott (2001) define it as the content, structure, and governance of transactions aimed at value creation through opportunity exploitation. Osterwalder (2004) further conceptualizes the business model as the rationale behind how organizations create, deliver, and capture value. This framework was refined by Osterwalder and Pigneur (2010) through the introduction of nine building blocks, which remain widely used in research and practice (Pawelek & Jenull, 2018). Leshke (2013) distinguishes the business model from the revenue model, emphasizing that the former encompasses all major aspects of a firm, while the latter focuses specifically on income generation.

In this study, we define a certain region's business model as the way it focuses on meeting basic human needs, follows public policy goals, responds to risks, and uses science and technology to grow. It also depends on how the region manages natural resources and is shaped by its geography. Together, these factors are reflected in the composition of its optimal stock market portfolio.

Business models are not merely operational tools but strategic frameworks that determine how value is created, delivered, and captured. Effective models must align with both internal capabilities and external opportunities, ensuring adaptability, resilience, and innovation. Moreover, the growing emphasis on sustainability and social responsibility requires that business models integrate environmental and social considerations alongside economic performance.

Given the intensifying global competition, entrepreneurs are increasingly driven to identify and adopt the most effective business models to maintain competitiveness and ensure sustainable growth (Graaf et al., 2012).

Each region of the world tends to follow a distinct economic model shaped by its historical, political, and social contexts. European countries, for example, are generally characterized by a socially oriented market economy, which blends market mechanisms with strong social policies and regulatory frameworks (Davidescu, 2017; Aiginger & Guger, 2005). In contrast, the United Kingdom and the United States are typically associated — at least in theory — with a liberal, free-market economic model that emphasizes minimal state intervention (Srinivasan, 2006). Beyond these Western paradigms, East Asian countries represent a third major model, often referred to as the developmental state. This approach is marked by a substantial role for the state in guiding economic development, including targeted support for strategic industries and a strong emphasis on export-oriented growth (Park, 2002; Danju et al., 2014).

Within the framework of the three models, notable variations emerge across specific subregions. Distinct institutional configurations have been identified for Southern, Northern, and Eastern Europe (Aiginger & Guger, 2005), as well as for the United Kingdom, the United States, and the regions of Southeast and Northeast Asia (Park, 2002). Among these, the

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case of Northern Europe is especially significant, as nations in this region have demonstrated a successful integration of socially oriented market economies with favorable institutional and regulatory conditions for business activity.

Each region of the world is characterized by distinct cultural, political, social, religious, and economic features, which shape its institutional structures and approaches to economic organization. Consequently, models of economic systems exhibit unique managerial philosophies and business practices reflective of their regional contexts. Among the most prominent paradigms in global business practice are two dominant approaches: the Anglo-American model, commonly associated with the United Kingdom and the United States, and the Rhineland model of capitalism, which is characteristic of several continental European countries (De Graaf et al., 2012; Sibbel, 2017).

The Anglo-American approach focuses on shareholders. Every other stakeholder group, such as employees, customers, and communities, is secondary. Companies that operate in accordance with the Anglo-American approach score well when it comes to productivity, returns, profits, and shareholder value in the shorter term.

In contrast to the Anglo-American approach, Rhineland capitalism is based on the concepts of cooperation between social partners (employees, employers, and government), consensus, social justice, and ensuring the interests of many stakeholders in the long run. This approach is also inherent in the Northern European countries. For example, the Netherlands has the most advanced consultation mechanism between social partners, Denmark achieves positive results due to its flexible labour system, and Sweden protects individual interests and social security, simultaneously fostering socioeconomic success.

At the same time, a certain drawback of the North European approach is the tension between individual and collective interests, despite the existence of the institution of consultations between the government, social institutions, companies, and employees (De Graaf et al, 2012).

The Northern European countries are consistently ranked among the low-risk countries (Atradius Economic Research Team, 2024), making the selection of the stock market as a platform for analyzing the business model of this group of countries a well-founded choice.

A distinguishing aspect of our analysis is the evaluation of key industries in each country through a comprehensive framework. This framework integrates priorities related to the fulfillment of human needs, alignment with public policy objectives, sensitivity to the country's risk profile, responsiveness to scientific and technological developments, reliance on natural resource utilization, and the influence of geographical factors.

According to Vault (n.d.), the four fastest-growing industries globally are energy, pharmaceuticals and biotechnology, engineering, and information technology. The growth prospects of these sectors appear highly promising, supported by ongoing advancements and increasing demand in each field.

In addition to industries with strong growth prospects in the coming years, it is crucial to consider the most essential sectors globally. These industries, characterized by a consistent demand for their products, represent attractive opportunities for both entrepreneurs and investors. Key sectors in this regard include utilities, public transportation, telecommunications, oil and gas production, cloud and colocation services, defense, and smart cities (Vertiv, n.d.).

In 2023, the most profitable industries globally included the wellness sector, e-commerce and online retail, automotive, entertainment and media, telecommunications, pharmaceuticals and biotechnology, artificial intelligence, renewable energy, global tourism, and software and technology (Rao, 2023).

Industries can also be ranked according to their involvement in data flows, which can be assessed by analyzing the number of scientific publications produced by companies within these sectors. Csomós (2017) conducted a bibliometric analysis using data from the Scopus database. Based on data spanning from 1980 to 2014, the study revealed that the leading industries in terms of intellectual contribution were pharmaceuticals and biotechnology, followed by technology hardware and equipment, electronic and electrical equipment, general industries, and software and computer services (Csomós, 2017).

AIMS AND OBJECTIVES

This research aims to construct a generalized business model that encapsulates the shared structural and strategic characteristics of selected Northern European countries. By bringing together these shared features, the study seeks to identify unique elements underpinning their economic resilience and competitiveness. Moreover, the article aims to offer strategic insights applicable to broader economic and policy contexts.

Hypothesis

The prevailing business model of the Northern European countries is a low-risk, science-intensive, predictable economy close to public priorities. Its functioning is based on its own natural resources, geographical location, and the dynamics of scientific changes. Such a model is stable in relation to world crises and military conflicts, even at maximum proximity. Compliance with a separate aspect of the hypothesis is accepted as a reality if the indicator from the selected sample is situated in the top three.

METHODS

To test the hypothesis, our research is divided into separate stages:

1. Based on stock exchanges (SE) index ingredients, calculation of Sortino, Sharpe, Maxdd, and Calmar ratios.
2. Determination of the risk influence level as a choice of criterion. Arguments for the Sharpe ratio in portfolio optimization.
3. Cumulative return and daily price change dynamics for testing war and pandemic influence.
4. Comparing the optimal portfolio with the weighted index I based on Crossref data.
5. Comparing the optimal portfolio with the weighted index S based on Scopus data.
6. Checking the diversity level.
7. Checking the predictability level.
8. Rejection or approval of the hypothesis.

The Sharpe Ratio calculation for general understanding could be presented as:

Sharpe Ratio = (Portfolio return — Risk-free rate) / Portfolio volatility (1.1)

The risk-free rate is different for every country. The next assumption could be made for the chosen stock markets: 252 trading days in a year. The preferred portfolio, the Sharpe ratio, has a higher risk-adjusted return than its volatility.

However, investors would prefer the fictional portfolio of only money-making months. The Sharpe ratio uses all the observations for calculating the standard deviation, but the Sortino ratio measures downside portfolio volatility using downside deviation. Sharpe ratio analysis should be paired with Sortino Ratio analysis to gain a more crucial understanding of the overall performance in question.

Max drawdown quantifies the steepest decline from peak to trough observed for an investment. This is useful for a number of reasons, mainly the fact that it doesn't rely on the underlying returns being normally distributed. Then, the next formula could be useful:

Drawdowns = peak-trough/peak (1.2)

The Calmar ratio uses max drawdown in the denominator as opposed to standard deviation. The Calmar ratio's focus on drawdown means its view of risk is rather limited compared to others.

All data were collected using company tickers and relevant Python packages. The methodologies for retrieving such information have evolved considerably in recent years, especially with regard to corporate accounting statistics.

Machine learning techniques were selected to analyze business predictability. A Random Forest is a capable estimator that leverages averaging to enhance its predictive precision and mitigate over-fitting. In the case of Gradient Boosting, a regression tree is fitted to the negative gradient of the applicable loss function for each stage. Support Vector Machine Regressor is beneficial due to the possibility of using a radial basis function kernel, or shortly rbf. Methods, such as enet, lasso, ridge, and decision tree, are also added for completeness of the spectrum.

In our research, we have used the list of Python packages: pandas_datareader, matplotlib.pyplot, numpy, statsmodels, datetime, famafrench, pypfopt.efficient_frontier, pypfopt, sklearn.tree, sklearn.linear_model, sklearn.svm. All data were taken from Yahoo.finance using pandas_datareader and ticker of the company or market index. The study was done at a

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time when there were no problems with reading companies' data from Yahoo.finance using the package pandas_data-reader.

In this study, we interpret the number of articles related to a particular industry found in the Crossref database as a reflection of societal interest. Crossref includes a wide variety of publication types — ranging from academic papers to industry reports and policy briefs — many of which are not subject to strict methodological or peer-review requirements. This broader scope allows us to form an *Index of intellectual contribution* that captures public attention and general discourse surrounding an industry.

On the other hand, we use the number of publications indexed in the Scopus database from 2018 to 2023 as an indicator of scientific interest. Scopus applies more rigorous standards, focusing on peer-reviewed and methodologically sound research, making it a reliable source for evaluating the academic relevance and research intensity associated with a given industry. By comparing both sources, we aim to distinguish between societal engagement and scientific focus.

RESULTS

Among the criteria for analysing market leaders based on major stock indices, we choose between a greater and lesser role of risk.

If the transition from the Sharpe ratio to Sortino and Calmar does not significantly transform the portfolio, then the issue of risk is secondary, and we should focus on analysing the portfolio within the framework of the Sharpe ratio. If the transformation is significant, it is possible to increase the risk weight and use two other criteria. In this way, we learn about the drawdown effect of volatility.

For Norway (Table 1), it's recognizable as a category of stocks that rely heavily on the business cycle and economic conditions; the storage, processing, and transportation of petroleum products; farming (in this region of Europe, as a local community's priority), and effective use of geographical location (as marine shipping). Utilities are also among the leaders.

Table 1. The performance metrics for the Norway SE market leaders.

C-S	Sortino	Industries	C-S	Sharpe	C-S	Maxdd	C-S	Calmar
KOG.OL	3.203	Aerospace&defence	KOG.OL	2.127	KOG.OL	-0.124	KOG.OL	4.858
KID.OL	3.185	Specialty Retail	KID.OL	1.766	ORK.OL	-0.129	HAUTO.OL	4.226
FRO.OL	2.678	Oil&Gas midstream	FRO.OL	1.659	DNB.OL	-0.138	KID.OL	3.519
TEL.OL	2.590	Telecommunications	ELMRA.OL	1.591	SRBNK.OL	-0.142	ELMRA.OL	3.436
ELMRA.OL	2.575	Utilities	SALM.OL	1.559	SALM.OL	-0.162	SALM.OL	3.131
GOGL.OL	2.453	Marineshipping	BWLPG.OL	1.557	MOWI.OL	-0.163	FRO.OL	2.810
SALM.OL	2.406	Farmproducts	TEL.OL	1.555	STB.OL	-0.168	BWLPG.OL	2.139
SCHB.OL	2.191	Publishing	HAUTO.OL	1.529	ABG.OL	-0.193	SCHB.OL	2.075
NAS.OL	2.190	Airlines	SCHB.OL	1.404	KID.OL	-0.193	MPCC.OL	1.990
SUBC.OL	2.120	Oil&Gasequipmentandservices	SNI.OL	1.394	TEL.OL	-0.197	HAFNI.OL	1.958
SNI.OL	2.101	Marineshipping	GOGL.OL	1.358	GJF.OL	-0.199	SUBC.OL	1.890

It is noteworthy that, in Denmark, the leading industry identified through this analysis is the production of hand-finished and contemporary jewelry (Table 2). In this case, we observe a clear predominance of technologies and a certain dissimilarity with Norway. At the same time, greater attention to risk on the part of the criteria does not destroy the priorities identified based on the Sharpe criterion.

Table 2. The performance metrics for Denmark SE market leaders.

C-S	Sortino	Industries	C-S	Sharpe	C-S	Maxdd	C-S	Calmar
PNDORA.CO	3.906	Luxury Goods	PNDORA.CO	2.133	NOVO-B.CO	-0.124	NOVO-B.CO	4.391
NOVO-B.CO	3.556	Biotechnology	NOVO-B.CO	1.705	PNDORA.CO	-0.168	PNDORA.CO	4.216
ZEAL.CO	3.349	Biotechnology	ZEAL.CO	1.674	DANSKE.CO	-0.172	DANSKE.CO	2.099
DEMANT.CO	1.991	Medical Devices	DANSKE.CO	1.296	DEMANT.CO	-0.187	DEMANT.CO	2.370
DANSKE.CO	1.926	Banks - Regional	DEMANT.CO	1.272	TRYG.CO	-0.208	TRYG.CO	-0.246
NKT.CO	1.644	Electrical Equipment & Parts	ROCK-B.CO	1.158	JYSK.CO	-0.214	JYSK.CO	0.796
ROCK-B.CO	1.450	Building Products & Equipment	NKT.CO	1.152	NDA-DK.CO	-0.232	NDA-DK.CO	0.570
AMBU-B.CO	1.320	Medical Devices	NSIS-B.CO	0.731	ZEAL.CO	-0.237	ZEAL.CO	4.047
NSIS-B.CO	1.170	Specialty Chemicals	AMBU-B.CO	0.725	NSIS-B.CO	-0.250	NSIS-B.CO	0.812
GN.CO	0.984	Medical Devices	GN.CO	0.574	NKT.CO	-0.267	NKT.CO	1.534

Finland (Table 3) is a combination of traditional industry, primary human priorities, and technology. Greater attention to risk here also remains consistent with the selection criteria based on the Sharpe ratio. As in Norway, utilities are among the priorities here.

Table 3. The performance metrics for Finland SE market leaders.

C-S	Sortino	Industries	C-S	Sharpe	C-S	Maxdd	C-S	Calmar
TELIA1.HE	12.036	Telecom Services	KCR.HE	3.750	KNEBV.HE	-0.071	TELIA1.HE	17.092
CGCBV.HE	6.704	Farm & Heavy Construction Machinery	CGCBV.HE	3.409	SAMPO.HE	-0.090	CGCBV.HE	9.625
KCR.HE	6.313	Farm & Heavy Construction Machinery	TELIA1.HE	2.779	TELIA1.HE	-0.097	KCR.HE	7.889
FORTUM.HE	3.786	Utilities - Renewable	FORTUM.HE	2.188	MANTA.HE	-0.099	KNEBV.HE	6.456
QTCOM.HE	3.383	Software - Application	QTCOM.HE	1.933	NDA-FI.HE	-0.101	QTCOM.HE	5.403
KNEBV.HE	3.240	Specialty Industrial Machinery	KNEBV.HE	1.917	KCR.HE	-0.124	MANTA.HE	3.616
NDA-FI.HE	2.230	Banks - Regional	NDA-FI.HE	1.568	CGCBV.HE	-0.126	NDA-FI.HE	3.118
KOJAMO.HE	2.162	Real Estate Services	TYRES.HE	1.188	VALMT.HE	-0.131	FORTUM.HE	2.866
VALMT.HE	1.868	Specialty Industrial Machinery	VALMT.HE	1.167	KESKOB.HE	-0.141	VALMT.HE	2.662
METSO.HE	1.760	Farm & Heavy Construction Machinery	KOJAMO.HE	1.073	OUT1V.HE	-0.153	TYRES.HE	2.571
STERV.HE	1.641	Paper & Paper Products	METSO.HE	1.054	STERV.HE	-0.154	METSO.HE	2.162

Traditional industry (beverages and gold mining) together with human priorities orientation (drugs, insurance) without technology prioritization – it's a basic short description according to our approach for Iceland (Table 4).

Table 4. The performance metrics for the Iceland SE market leaders.

C-S	Sortino	Industries	C-S	Sharpe	C-S	Maxdd	C-S	Calmar
SIMINN.IC	265.573	Telecom Services	OLGERD.IC	1.606	OLGERD.IC	-0.110	SIMINN.IC	112.254
OLGERD.IC	3.133	Beverages - Brewers	AMRQ.IC	1.318	HAGA.IC	-0.144	OLGERD.IC	4.000
AMRQ.IC	2.374	Gold	SIMINN.IC	0.854	FESTI.IC	-0.144	AMRQ.IC	1.874
ALVO.IC	0.624	Drug Manufacturers - Specialty & Generic	ALVO.IC	0.458	SJOVA.IC	-0.145	SJOVA.IC	0.921
SJOVA.IC	0.509	Insurance - Property & Casualty	SJOVA.IC	0.358	ARION.IC	-0.162	HAMP.IC	0.727
HAMP.IC	0.304	Textile Manufacturing	HAMP.IC	0.235	HAMP.IC	-0.187	FESTI.IC	0.609
SKEL.IC	0.231	Specialty Retail	SKEL.IC	0.133	REGINN.IC	-0.193	ALVO.IC	0.607
FESTI.IC	0.119	Specialty Retail	FESTI.IC	0.082	REITIR.IC	-0.199	HAGA.IC	0.604
HAGA.IC	0.110	Grocery Stores	MAREL.IC	0.070	ISB.IC	-0.200	ARION.IC	0.383
MAREL.IC	0.101	Specialty Industrial Machinery	HAGA.IC	0.059	AMRQ.IC	-0.203	SKEL.IC	0.374
ARION.IC	-0.099	Banks - Regional	ARION.IC	-0.053	KALD.IC	-0.227	MAREL.IC	0.217

The optimal choice for Ireland (Table 5) also contains some rather interesting ingredients. C5H.OR (Cairn Homes plc), a holding company, operates as a home and community builder. The company engages in the development and sale of

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residential properties, as well as the rental of properties. Glenveagh Properties PLC (GVR.IR) also constructs and sells houses and apartments for private buyers, local authorities, and the private rental sector. In other words, in addition to traditional industries (airlines, banking sector, building equipment), we observe an orientation towards basic human needs (housing, food, treatment). The transition to risk-oriented metrics does not significantly change the optimal choice. If we double the number of companies considered among the leaders of the index, we also monitor the use of geographic location and the already defined characteristics (we add tourism services).

Table 5. The performance metrics for the Irish SE market leaders.

C-S	Sortino	Industries	C-S	Sharpe	C-S	Maxdd	C-S	Calmar
C5H.IR	4.212	Residential Construction	C5H.IR	2.326	GL9.IR	-0.095	C5H.IR	5.797
GL9.IR	2.972	Packaged Foods	GL9.IR	1.534	C5H.IR	-0.105	GL9.IR	3.657
GVR.IR	2.454	Residential Construction	GVR.IR	1.398	IR5B.IR	-0.117	HVO.IR	3.063
KRX.IR	2.082	Building Products & Equipment	KRX.IR	1.260	A5G.IR	-0.172	KRX.IR	2.210
RYA.IR	1.527	Airlines	RYA.IR	1.076	RYA.IR	-0.178	A5G.IR	2.064
A5G.IR	1.464	Banks - Regional	A5G.IR	1.049	DHG.IR	-0.181	IR5B.IR	1.948
DHG.IR	1.362	Lodging	DHG.IR	0.825	KRX.IR	-0.207	RYA.IR	1.804
IR5B.IR	1.307	Marine Shipping	IR5B.IR	0.808	GVR.IR	-0.216	GVR.IR	1.743
SK3.IR	1.131	Packaging & Containers	SK3.IR	0.808	DQ7A.IR	-0.223	DHG.IR	1.354
HSW.IR	0.984	Travel Services	HSW.IR	0.727	GRP.IR	-0.236	HSW.IR	1.295
BIRG.IR	0.701	Banks - Regional	BIRG.IR	0.529	SK3.IR	-0.239	SK3.IR	1.061

In the case of the Netherlands (see Table 6), technology and basic human needs are among the priorities of the stock market. Let's add traditional industry to this (EXO.AS). Doubling the number of companies in the analyzed portfolio does not change the indicated priorities.

Table 6. The performance metrics for the Netherlands SE market leaders.

C-S	Sortino	Industries	C-S	Sharpe	C-S	Maxdd	C-S	Calmar
AGN.AS	2.665	Insurance - Diversified	AGN.AS	2.148	EXO.AS	-0.080	AGN.AS	4.840
ASM.AS	2.457	Semiconductor Equipment & Materials	ASM.AS	1.591	AGN.AS	-0.096	EXO.AS	3.516
EXO.AS	2.401	Farm & Heavy Construction Machinery	EXO.AS	1.553	UMG.AS	-0.118	ASM.AS	3.051
ASML.AS	2.035	Semiconductor Equipment & Materials	BESI.AS	1.425	UNA.AS	-0.122	UMG.AS	2.912
BESI.AS	1.819	Semiconductor Equipment & Materials	UMG.AS	1.283	SHELL.AS	-0.128	BESI.AS	2.061
UMG.AS	1.811	Entertainment	ASML.AS	1.220	WKL.AS	-0.129	ASML.AS	1.933
WKL.AS	1.553	Specialty Business Services	NN.AS	1.198	RAND.AS	-0.178	NN.AS	1.810
SHELL.AS	1.415	Oil & Gas Integrated	WKL.AS	1.178	AD.AS	-0.187	WKL.AS	1.797
NN.AS	1.208	Insurance - Diversified	ASRNL.AS	1.040	ASRNL.AS	-0.194	SHELL.AS	1.642
ASRNL.AS	1.184	Insurance - Diversified	SHELL.AS	1.017	ASML.AS	-0.206	ASRNL.AS	1.515
UNA.AS	0.560	Household & Personal Products	PRX.AS	0.345	NN.AS	-0.211	PRX.AS	0.628

Thus far, the findings offer partial confirmation of the hypothesis proposed in the introduction—namely, that regions characterized by a focus on fundamental human needs tend also to exhibit lower investment risk. While some sectors aligned with essential services such as healthcare, education, and social welfare are indeed present in the optimal portfolios, they do not consistently dominate. This suggests that, although there is a degree of alignment between socially oriented priorities and financial stability, the relationship is not absolute. Market dynamics often favor industries with higher returns regardless of their direct relevance to human well-being, indicating that financial optimization and social value do not always coincide. As such, the hypothesis is supported in part but also challenged by the complexity of real-world investment behavior.

Using the Efficient Frontier method and Sharpe ratio maximization, our analysis clearly identifies Norway as the leading country in terms of investment priorities, as defined by the criteria discussed earlier. While a general risk-based approach offers a broad view, it lacks the depth needed to capture key differences between industries. In contrast, the optimal portfolio method reveals significant variation across sectors, showing that industries related to basic human needs — such as healthcare, education, and social welfare — do not always hold a leading place in investment efficiency (Table 7). Instead, sectors like gold mining and luxury goods, which are less directly connected to fundamental social priorities, often emerge as top performers. This highlights a gap between what is socially important and what is financially optimal, raising important questions about how investment decisions align with long-term public goals.

Table 7. Optimal portfolio based on the Efficient Frontier method (Sharpe ratio maximization). Notes: Stock Start Date = '2023-01-01', today = '2024-03-01'.

Norway	***Ireland***
TEL.OI (Telenor) - communication services (0.203)	C5H.IR (Cairn Homes) - Residential Construction (0.37225)
KOG.OL (Kongsberg) - Aerospace & Defense (0.186)	GL9.IR (Glanbia) - Packaged Foods (0.2379)
KID.OL (Kid ASA) – specialty retail (0.13)	HVO.IR (hVIVO) - Biotechnology (0.14778)
SALM.OL (SalMar) - farm products (0.11)	RYA.IR (Ryanair) - Airlines (0.14764)
ELMRA.OL (Elmera) - utilities (0.064)	KRX.IR (Kingspan) - Building Products & Equipment (0.05492)
HAUTO.OL (Hoegh Autoliners) - marine shipping (0.053)	DHG.IR (Dalata Hotel) - Lodging (0.00529)
ADE.OL (Adevinta) - communication services (0.05)	HSW.IR (Hostelworld) - Travel Services (0.02409)
ORK.OL (Orkla) - packaged foods (0.04)	IR5B.IR (Irish Continental) - Marine Shipping (0.01013)
MPCC.OL (MPC Container Ships) - marine shipping (0.023)	*Expected annual return: 63.4%*
Expected annual return: 65.1%	*Annual volatility: 16.0%*
Annual volatility: 12.1%	*Sharpe Ratio: 3.83*
Sharpe Ratio: 5.20	
Iceland	***Finland***
AMRQ.IC (Amaroq Minerals) - gold (0.4753)	KCR.HE (Konecranes) - Farm & Heavy Construction Machinery (0.37655)
OLGERD.IC (Ölgerðin Egill Skallagrímsson) - Beverages - Brewers (0.36586)	TELIA1.HE (Telia) - Telecom Services (0.34658)
SJOVA.IC (Sjóvá-Almennar) - Insurance - Property & Casualty (0.10344)	QTCOM.HE (Qt Group) - Software - Application (0.17405)
HAMP.IC (Hampiðjan) - Textile Manufacturing (0.05134)	MANTA.HE (Mandatum) - Financial Conglomerates (0.05484)
ALVO.IC (Alvotech) - Drug Manufacturers (0.00347)	CGCBV.HE (Cargotec) - Farm & Heavy Construction Machinery (0.04798)
SIMINN.IC (Síminn) - Telecom Services (0.0006)	*Expected annual return: 77.9%*
Expected annual return: 55.8%	*Annual volatility: 26.3%*
Annual volatility: 15.8%	*Sharpe Ratio: 2.88*
Sharpe Ratio: 3.41	
The Netherlands	***Denmark***
WKL.AS (Wolters Kluwer) - Specialty Business Services (0.46135)	PNDORA.CO (Pandora) - Luxury Goods (0.37415)
BESI.AS (BE Semiconductor Industries) - Semiconductor Equipment & Materials (0.3407)	ZEAL.CO (Zealand Pharma) - Biotechnology (0.21644)
ASM.AS (ASM International) - Semiconductor Equipment & Materials (0.08496)	NOVO-B.CO (Novo Nordisk) - Biotechnology (0.19809)
SHELL.AS (Shell) - Oil & Gas Integrated (0.06168)	DANSKE.CO (Danske Bank) - Banks - Regional (0.10647)
AD.AS (Koninklijke Ahold Delhaize) - Grocery Stores (0.05131)	ROCK-B.CO (Rockwool) - Building Products & Equipment (0.06688)
Expected annual return: 82.5%	DEMANT.CO (Demant) - Medical Devices (0.03797)
Annual volatility: 18.1%	*Expected annual return: 98.9%*
Sharpe Ratio: 4.45	*Annual volatility: 21.4%*
	Sharpe Ratio: 4.53

To further evaluate the investment attractiveness and stability of the selected Northern European economies, we applied the Sharpe Ratio as a key metric for assessing risk-adjusted returns. The Sharpe Ratio measures how well the return of an asset compensates for the risk taken, with higher values indicating a more favorable balance between return and volatility.

The results demonstrate significant variation among the countries analyzed. Norway achieved a Sharpe Ratio of 5.20, reflecting an exceptionally high level of investment efficiency. This suggests that Norway's stock market portfolio delivers superior returns with relatively low risk, positioning it as the most financially resilient and stable among the group.

Denmark and the Netherlands followed closely with a Sharpe Ratio of 4.53 and 4.45, respectively, which also indicates strong risk-adjusted performance. These countries appear to maintain a robust investment environment, capable of generating consistent returns despite global uncertainties.

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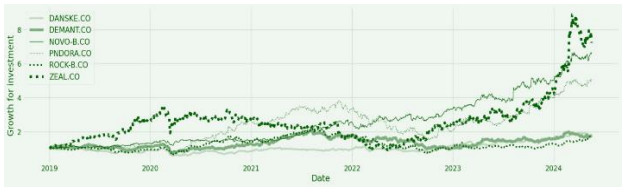
Finland, with a lowest Sharpe Ratio of 2.88, still exhibits a healthy balance between risk and return, although to a lesser extent. While its performance is positive, it suggests a relatively lower efficiency in converting risk into returns when compared to Norway, Denmark, and the Netherlands.

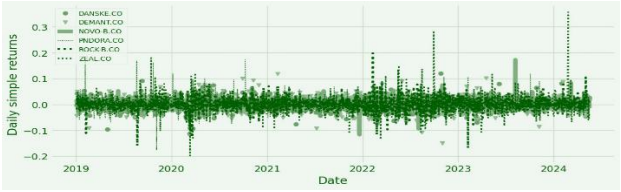
Cumulative return and risk

The influence of economic crises and military conflicts is assessed by analyzing the dynamics of cumulative investment returns and the daily changes in verified stock prices of companies within the selected sample. We define the impact as minimal when market responses are both short-term and limited in scale. This study specifically examines market reactions to three major global events: the COVID-19 pandemic, the Russian invasion of Ukraine (beginning February 2022), and the escalation of the Israeli conflict in September 2023, which carried the potential for broader regional involvement. Our findings indicate that the pandemic had a moderate and short-lived impact on investment returns, with risk indicators showing a more pronounced sensitivity. However, the military conflicts in Ukraine and Israel had an even less noticeable effect on the stock markets of the countries analyzed. As shown in Figures 1 and 2, these geopolitical shocks did not lead to significant or prolonged disruptions in market performance.

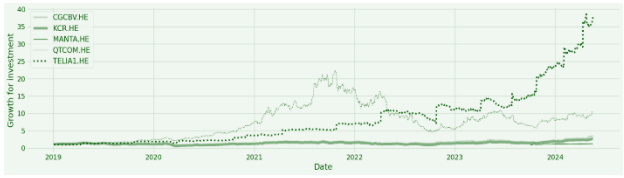
This suggests a notable degree of resilience in the financial systems of the Northern European countries studied. Such resilience may be attributed to several interrelated factors, including the presence of well-diversified and innovation-driven economies that reduce reliance on any single sector or external partner. In addition, strong institutional frameworks — characterized by transparent governance, sound regulatory systems, and high levels of public trust — contribute to market stability even in times of global uncertainty. Furthermore, these countries tend to implement proactive and coordinated crisis management strategies, supported by robust fiscal and monetary policies, which help absorb and neutralize the adverse effects of external shocks. Together, these structural and policy-based advantages allow the financial markets in these countries to respond to global disruptions with greater composure and efficiency compared to less integrated or more politically volatile economies.



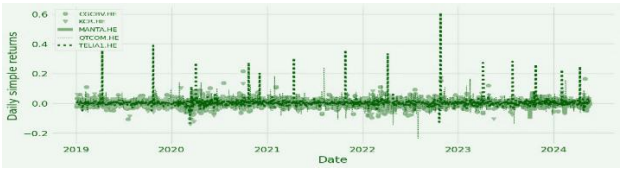
1. a. Denmark



2. a. Denmark

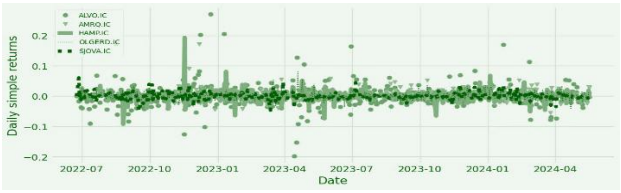


1. b. Finland



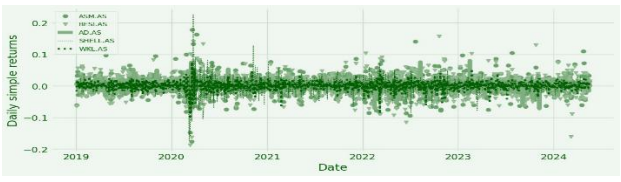
2. b. Finland

1. c. Iceland

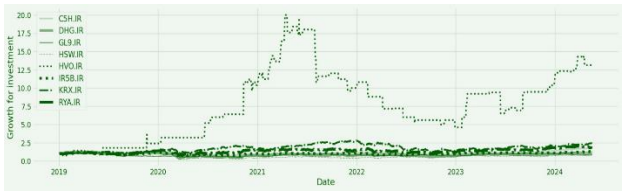


2. c. Iceland

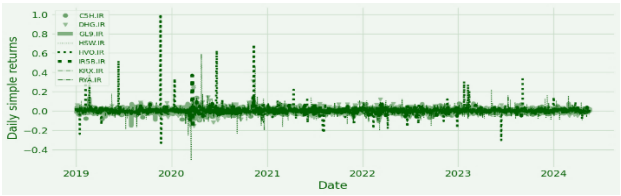
1. d. The Netherlands



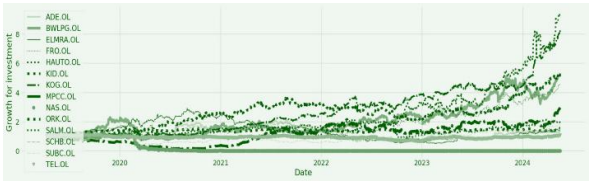
2. d. The Netherlands



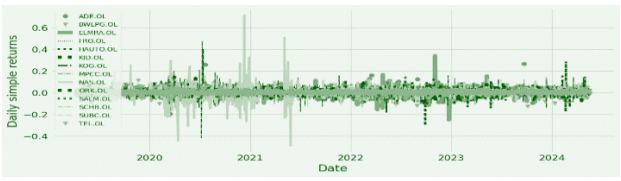
1. e. Ireland



2. e. Ireland



1. f. Norway



2. f. Norway

Figure 1 (a-f). The Northern European countries' cumulative return. *(Source: authors' own calculations based on historical data retrieved from Yahoo Finance)*

Figure 2 (a-f). The Northern European countries' risk. Notes: risk level as daily price return change *(Source: authors' own calculations)*

Intellectual contribution

The following part of the analysis examines whether the Northern European countries' business model is science-intensive and responsive to the evolving needs of society. For this purpose, we examine how often specific industries are mentioned in the titles of scientific articles and compare this distribution with the composition of each country's optimal investment portfolio. This allows us to explore the relationship between public/ intellectual attention and investment priorities.

We use data from the Crossref database to create an Index of intellectual contribution that gives each investment portfolio a weighted score based on how often its industries are mentioned in article titles. This helps us understand how well the industries in each country's portfolio match public interest.

Table 8. Index of intellectual contribution. Notes: * - weighted sum. **- Index of intellectual contribution to the economy (weighted sum/1000000). Two of the three leaders in the Sharpe ratio and intellectual contribution (index I) are matching. *(Source: authors' processing in Python based on Crossref)*

Iceland	***Finland***
Gold – 238133 x 0.4753 = 113184.62	Heavy Construction Machinery – 793640 x (0.37655 + 0.04798) = 336923.99
Beverages – 15350 x 0.36586 = 5615.95	Farm machinery – 142178 x (0.37655 + 0.04798) = 60358.83
Insurance – 106657 x 0.10344 = 11032.60	Telecom services – 617474 x 0.34658 = 214004.14
Textile manufacturing – 497407 x 0.05134 = 25536.88	Software – Application – 1837893 x 0.17405 = 319885.28
Drug manufacturing – 1186076 x 0.00347 = 4115.68	Financial Conglomerates – 414854 x 0.05484 = 22750.59
Telecom services – 617474 x 0.0006 = 370.48	*Weighted sum = 953922.83*; I** = 0.95*
Weighted sum = 159855.61; I** = 0.16*	
The Netherlands	***Denmark***
Specialty Business Services – 1529266 x 0.46135 = 705526.86	Luxury Goods – 52572 x 0.37415 = 19669.81
Semiconductor Equipment & Materials – 3361751 x (0.08496 + 0.3407) = 1430962.93	Biotechnology – 400625 x (0.21644 + 0.19809) = 166071,08
Oil & Gas Integrated – 1668890 x 0.06168 = 102937.13	Banks – Regional – 532089 x 0.10647 = 56651.51
Grocery Stores – 15948 x 0.05131 = 818.29	Building Products & Equipment – 1073791 x 0.06688 = 71 815.14
*Weighted sum = 2240245.21; I** = 2.2*	Medical Devices – 3156092 x 0.03797 = 119 836,81
	*Weighted sum = 434 044,35; I** = 0,4*
Norway	***Ireland***
Communication services – 1635941 x 0.203 = 332 096,02	Residential Construction 610682 x 0.37225 = 227326.37
Aerospace & Defense - 284747 x 0.186 = 52 962,94	Packaged Foods 100337 x 0.2379 = 23 870.17
Specialty retail – 65859 x 0.13 = 8 561,67	Biotechnology 400625 x 0.14778 = 59 204.36
Farm products – 511282 x 0.11 = 56 241,02	Airlines 4591 x 0.14764 = 677.81
Utilities – 13326 x 0.064 = 852,86	Building Products & Equipment 1074327 x 0.05492 = 59002.03
Marine shipping – 493652 x 0.053 = 26 163,55	Lodging 2922 x 0.00529 = 15.45
Communication services – 1636959 x 0.05 = 81 847,95	Travel Services 694905 x 0.02409 = 6740.26
Packaged foods – 100337 x 0.04 = 4 013,48	Marine Shipping 493652 x 0.01013 = 5000.69
*Weighed sum = 562 739.49; I** = 0.6*	*Weighted sum = 381 837,14; I** = 0.4*

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This result can now be compared with the outcomes derived from the Sharpe ratio-based analysis, which prioritizes financial efficiency by balancing return and risk. By placing these two perspectives side by side — intellectual contribution as a proxy for societal and knowledge-based value, and the Sharpe ratio as a measure of investment attractiveness — we can begin to assess the extent to which sectors that attract high levels of intellectual engagement also demonstrate strong financial performance. This raises a critical question: is intellectual contribution a decisive factor in defining an industry's strategic value, or does financial performance follow a different logic altogether? Such a comparison provides a meaningful opportunity to explore whether knowledge-intensive industries are also those most rewarded in the market, or whether market-driven optimization diverges from knowledge-based societal priorities.

Table 9. Intellectual contribution (based on Scopus). Notes: Research period 2018 – 2023. *(Source: https://www.scopus.com/search)*

Iceland	***Finland***
Gold – 190354 x 0.4753 = 90475.26	Heavy Construction Machinery – 343 x (0.37655 + 0.04798) = 145.61
Beverages – 40315 x 0.36586 = 14747.23	Farm machinery – 1976 x (0.37655 + 0.04798) = 838.87
Insurance – 108126 x 0.10344 = 11180.23	Telecom services 1728 x 0.34658 = 598.89
Textile manufacturing – 4925 x 0.05134 = 252.85	Software – Application – 156191 x 0.17405 = 27185.04
Drug manufacturing – 16134 x 0.00347 = 55.98	Financial Conglomerates – 223 x 0.05484 = 12.23
Telecom services – 1728 x 0.0006 = 1.03	*Weighted sum = 28780.64*; S** = 0.029*
Weighted sum = 116712.58; S** = 0.12*	
The Netherlands	***Denmark***
Specialty Business Services – 178 x 0.46135 = 82.12	Luxury Goods – 889 x 0.37415 = 332.62
Semiconductor Equipment & Materials – 4407 x (0.08496 + 0.3407) = 1875.88	Biotechnology – 48969 x (0.21644 + 0.19809) = 20299.11
Oil & Gas Integrated – 5895 x 0.06168 = 363.6	Banks – Regional – 3715 x 0.10647 = 395.53
Grocery Stores – 2796 x 0.05131 = 143.46	Building Products & Equipment – 1254 x 0.06688 = 83.87
*Weighted sum =2465.06; S** = 0.002*	Medical Devices – 100788 x 0.03797 = 3826.92
	*Weighted sum = 24938.05; S** = 0.02*
Norway	***Ireland***
Communication services – 115694 x 0.203 = 23485.88	Residential Construction 9232 x 0.37225 = 3436.61
Aerospace & Defense - 2236 x 0.186 = 415.9	Packaged Foods 3410 x 0.2379 = 811.24
Specialty retail – 173 x 0.13 = 22.49	Biotechnology 48969 x 0.14778 = 7236.64
Farm products – 12296 x 0.11 = 1352.56	Airlines 9091 x 0.14764 = 1314.92
Utilities – 254814 x 0.064 = 16308.09	Building Products & Equipment 1254 x 0.05492 = 68.87
Marine shipping – 3224 x 0.053 = 170.87	Lodging 3623 x 0.00529 = 19.17
Communication services – 115694 x 0.05 = 5784.7	Travel Services 19565 x 0.02409 = 471.32
Packaged foods – 3410 x 0.04 = 136.4	Marine Shipping 3224 x 0.01013 = 32.66
*Weighed sum = 47676.89; S** = 0.05*	*Weighted sum =13391.43; S** = 0,013*

Norway demonstrates a notable combination of high intellectual engagement — reflected in the significant presence of its key industries in academic and public discourse — and strong financial performance, as evidenced by its superior Sharpe ratio and the composition of its optimal investment portfolio. This alignment suggests a well-integrated model in which knowledge production, public priorities, and economic returns mutually reinforce one another.

Among the Northern European countries, Finland stands out for its relatively higher levels of intellectual engagement; however, this is accompanied by comparatively lower financial performance within the context of optimal investment portfolios. This may be attributed to Finland's economic model and public policies, which prioritize stability, social welfare, and sustainability over short-term financial gains. As a result, the investment environment tends to favor long-term resilience and societal well-being rather than high-risk, high-return sectors such as speculative technology or luxury goods — industries that often dominate top-performing investment portfolios.

The Netherlands' economic structure also exemplifies a well-balanced integration of societal needs, academic focus, and financial outcomes. High levels of public and intellectual attention toward the sectors represented in its optimal investment portfolio indicate that the country's innovation ecosystem is not only research-driven but also socially responsive.

Altogether, the Norwegian, Finnish, and Dutch business models present a compelling case for how advanced economies can strategically align research priorities, societal interests, and investment logic to achieve resilience and long-term growth.

Diversification

For a well-diversified portfolio, it is logical to use the Treynor ratio since it contains a stock market indicator. Diversification is important because it provides significantly greater opportunities for innovation and competition and, therefore, for development.

For better presentation, let's divide our sample into two groups (Tables 10, 11).

Table 10. Diversity influence (group 1).

Denmark			The Netherlands		Finland	
ZEAL.CO	55.52	biotechnology	BESI.AS	10.51	TELIA1.HE	80.77
NOVO-B.CO	26.34	biotechnology	ASM.AS	10.27	QTCOM.HE	8.03
PNDORA.CO	7.17	luxury goods	ASML.AS	2.23	CGCBV.HE	4.74
DEMANT.CO	3.51	medical devices	WKL.AS	2.10	KCR.HE	3.44
NKT.CO	3.27	electrical equipment & parts	NN.AS	1.79	NDA-FI.HE	0.67
ROCK-B.CO	3.17	building products & equipment	UMG.AS	1.53	METSO.HE	0.63
DANSKE.CO	2.71	banks - regional	AGN.AS	1.42	STERV.HE	0.26

In the example of Denmark, we can see that the leadership of industries is unchanged or changes only with respect to individual participants. The same small disturbance is present in the Norwegian portfolio.

Table 11. Diversity influence (group 2).

Iceland		Ireland		Norway		
AMRQ.IC	23.50	MLC.IR	23.00	HAUTO.OL	37.54	Marine Shipping
OLGERD.IC	9.07	HSW.IR	17.74	KID.OL	36.95	Specialty Retail
ALVO.IC	7.63	IR5B.IR	3.92	MPCC.OL	18.38	Marine Shipping
HAGA.IC	5.28	C5H.IR	3.90	FRO.OL	14.09	Oil & Gas Midstream
SJOVA.IC	1.37	GL9.IR	3.44	BWLPG.OL	12.94	Marine Shipping
SKEL.IC	1.31	KRX.IR	2.62	ELMRA.OL	12.46	Utilities - Regulated Electric
HAMP.IC	1.28	GVR.IR	1.97	NAS.OL	12.93	Airlines
ARION.IC	0.22	A5G.IR	1.89	ADE.OL	11.42	Internet Content & Information
MAREL.IC	0.14	KMR.IR	1.89	SCHB.OL	8.83	Publishing

Introducing the diversification test does not significantly change our choice of optimal portfolios. This indicates the presence of this characteristic in our selected samples.

Predictability

How predictable is such a business? Using machine learning methods for a 10-day - period could be calculated the proper determination coefficient R^2 (Table 12) could be calculated.

Table 12. Useful examples for predictability analysis.

C-s	svr	rf	gb	ridge	lasso	enet	lr	dt
TEL.OL	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.98
FRO.OL	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.97
ELMRA.OL	0.94	0.94	0.94	0.94	0.94	0.94	0.94	0.92
OLGERD.IC	0.97	0.97	0.97	0.95	0.95	0.95	0.95	0.97
ALVO.IC	0.91	0.95	0.94	0.85	0.85	0.85	0.85	0.91
SJOVA.IC	0.90	0.90	0.93	0.91	0.91	0.91	0.91	0.92
RYA.IR	0.98	0.98	0.98	0.98	0.98	0.98	0.98	0.98

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We do not need to increase the number of companies to discover the level of confidence of machine learning models. In our random sample, there is not a single company for which at least one method did not allow creating prediction models with the required accuracy.

DISCUSSION

Now we can group the information we collected within one Table 13.

Table 13. Intellect, society interest closeness, risk, and return-based ranking analysis. Notes: ranking is situated in brackets. Being among the leaders is considered an acceptable deviation.

Country	Intellectual contribution index	Sharpe Ratio	Science contribution index
Iceland	0.16	3.41	0.12 (1)
Finland	0.95 (2)	2.88	0.03 (3)
The Netherlands	2.2 (1)	4.45 (3)	0.002
Denmark	0.4	4.53 (2)	0.02
Norway	0.6 (3)	5.2 (1)	0.05 (2)
Ireland	0.4	3.83	0.01

Among the countries studied, Norway emerges as the most comprehensive embodiment of the proposed business model, consistently performing across all key dimensions, including low investment risk, strong scientific output, public interest alignment, and effective use of natural and geographical resources. Norway's economy demonstrates a high level of resilience, adaptability, and strategic coherence, making it a benchmark for the type of balanced, innovation-driven economic structure described in our hypothesis.

Finland and the Netherlands also show considerable alignment with this model. Finland, with its strong emphasis on education, technological development, and environmental sustainability, closely mirrors the science-intensive and public-oriented profile of Norway. The Netherlands, known for its efficient infrastructure, diversified economy, and strong research base, similarly reflects many elements of the hypothesized model. Although these two countries may not meet every criterion at the same level as Norway, their consistent presence near the top of several key indicators suggests they are well-positioned within the same trajectory of economic resilience and knowledge-based development.

Policymakers and economic strategists may draw from these cases to shape national development paths that prioritize:

1. ***Resilience through diversification**:* Norway's economic stability, grounded in a mix of natural resource utilization and strong institutions, demonstrates the value of economic diversification in buffering against external shocks.
2. ***Human-centered innovation**:* Countries performing well in aligning business activity with public priorities illustrate that innovation and competitiveness can coexist with strong social infrastructure, such as healthcare, education, and welfare systems.
3. ***Science and policy integration***: High levels of scientific output and sectoral alignment – especially in Finland – highlight the strategic advantage of embedding research and development priorities within broader public policy agendas.
4. ***Sustainability and geographical positioning***: The success of these countries in leveraging natural resources while maintaining environmental stewardship provides a model for sustainable economic development adaptable to other regional contexts.

CONCLUSIONS

This study set out to explore whether the consistently high-performing Northern European countries – namely Iceland, Ireland, Denmark, the Netherlands, Norway, and Finland – share a common economic model characterized by inclusive governance, sustainability, innovation, and resilience. To this end, a generalized business model was developed, focusing on essential dimensions such as responsiveness to human needs, alignment with public policy goals, risk management, scientific and technological advancement, efficient use of natural resources, and geographical context. These factors were operationalized through the analysis of optimal stock market portfolios for each country.

The study also examined the resilience of these economies to global crises and military conflicts. While the analysis did not confirm the existence of a single, unified business model across all countries, Norway emerged as a distinctive case – demonstrating strong alignment with all dimensions of the proposed framework. Finland and the Netherlands also showed close proximity to the model, suggesting the potential for convergence in the future.

Additionally, the research introduced a novel methodology for assessing intellectual contributions to national economies using data from the Crossref and Scopus databases, as well as stock market analytics conducted with Python-based tools. This interdisciplinary approach provided further insight into how public and scientific interest may influence sectoral investment patterns.

In summary, while a fully shared Northern European business model does not currently exist, the foundations observed in Norway – and to a lesser extent in Finland and the Netherlands – point toward the possibility of such a model emerging. Whether this trajectory will continue remains uncertain, especially in the context of evolving global risks and policy challenges. Nonetheless, the findings offer a meaningful contribution to understanding the interplay between economic structures, societal needs, and regional resilience in the 21st century.

ADDITIONAL INFORMATION

AUTHOR CONTRIBUTIONS

All authors have contributed equally.

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CONFLICT OF INTEREST

The Authors declare that there is no conflict of interest.

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ПІВНІЧНА ЄВРОПА: ДОСЛІДЖЕННЯ ІСНУВАННЯ СПІЛЬНОЇ БІЗНЕС-МОДЕЛІ

З огляду на те, що Ісландія, Ірландія, Данія, Нідерланди, Норвегія та Фінляндія стабільно посідають високі позиції в глобальних рейтингах, які відображають інклюзивне врядування, сталий розвиток, інноваційність та економічну конкурентоспроможність, виникає потреба дослідити, чи мають їхні бізнесові моделі спільні або унікальні риси, що впливають на здатність цих країн реагувати на глобальні виклики, сприяти інноваціям і зберігати стійкість у контексті економічних чи геополітичних потрясінь. З цією метою автори розробили узагальнену бізнес-модель для вибраних країн Північної Європи. Модель базується на ключових чинниках: задоволення базових людських потреб, узгодженість із державними пріоритетами, управління ризиками, розвиток науки й технологій, ефективне використання природних ресурсів і врахування географічного контексту. Ці елементи відображаються в оптимальному портфелі фондового ринку кожної країни. У дослідженні також перевірено стійкість країн до глобальних криз і потенційний вплив воєнних конфліктів. Хоча результати не підтверджували існування міжнаціональної єдиної бізнес-моделі, бізнес-модель Норвегії була визнана унікальною порівняно з іншими країнами в аналізі. Фінляндія та Нідерланди також продемонстрували високий ступінь узгодженості з моделлю, що вказує на те, що їхні поточні траєкторії значною мірою відповідають її параметрам. Це свідчить про великий потенціал для зближення політик і результатів у найближчому майбутньому. Автори використали відповідні пакети Python і запропонували новий підхід до оцінки інтелектуального внеску в економіку – Intellectual contribution index. Цей індекс будується на основі даних із бази даних Crossref, де кожному інвестиційному портфелеві присвоюють зважену оцінку на основі частоти, з якою пов'язані з ним галузі з'являються в назвах наукових статей.

Ключові слова: бізнес-модель, оптимальний портфель, індекс інтелектуального внеску, індекс наукового внеску, коефіцієнт Шарпа, пакети Python, країни Північної Європи

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